

What is claimed is:

1. A master disc for the preparation of an optical recording medium having a groove formed along a recording track and illuminated by the light with a wavelength  $\lambda$  for recording and/or reproduction, comprising:

a substrate having formed thereon a crest-and-groove pattern corresponding to said groove, a first groove pattern and a second groove pattern are formed to a first depth to describe a double helix and wherein a third groove pattern having a second depth shallower than said first depth is formed between said first and second groove patterns describing double helices, wherein said master disc being configured to receive thereon the optical recording medium which is subsequently removed although retaining a transcription of the crest-and-groove pattern and at least one of said first and second groove patterns is a wobbling groove pattern formed so that at least a portion thereof is meandered.

2. The master disc for the preparation of an optical recording medium according to claim 1 wherein, if a phase depth of said first and second groove patterns represented by  $x \times n_x / \lambda$ ,  $x$  being said first depth and  $n_x$  being a refractive index of a medium from the light incident surface to said first and second grooves, is  $X$ , and if a phase depth of said third groove pattern represented by  $y \times n_y / \lambda$ ,  $y$  being said second depth and  $n_y$  being a refractive index of a medium from the light incident surface to said third groove, is  $Y$ , said first, second and third groove patterns are set for satisfying the equations (1) to (3) or the equations (4) and (5):

$$Y \geq 36.9189 - 208.0190X + 294.3845X^2 \quad \dots(1)$$

$$Y \geq -1.2977 + 8.2017X - 15.8226X^2 + 12.3273X^3 \quad \dots(2)$$

$$Y \leq -214.05681 + 2423.29342X - 10933.24673X^2 + 24597.79851X^3 - 27576.99399X^4 + 12319.79865X^5 \quad \dots(3)$$

$$Y \geq -4.6463 + 30.2156X - 64.3100X^2 + 47.1308X^3 \quad \dots(4)$$

$$Y \leq 2.7669 - 20.0529X + 48.0353X^2 - 35.4870X^3 \quad \dots(5).$$

3. The master disc for the preparation of an optical recording medium according to claim 1 wherein, if a phase depth of said first and second groove patterns represented by  $x \times n_x / \lambda$ ,  $x$  being said first depth and  $n_x$  being a refractive index of a medium from the light incident surface to said first and second grooves, is  $X$ , and if a phase depth of said third groove pattern represented by  $y \times n_y / \lambda$ ,  $y$  being said second depth and  $n_y$  being a refractive index of a medium from the light incident surface to said third groove, is  $Y$ , said first, second and third groove patterns are set for satisfying the equations (6) and (7) or the equations (8) and (9):

$$Y \geq 0.8680 - 7.3968X + 21.8561X^2 - 17.5125X^3 \quad \dots(6).$$

$$Y \leq -261.77076 + 3646.50412X - 20988.26504X^2 + 63944.54992X^3 - 108758.21706X^4 + 97951.29191X^5 - 36518.20328X^6 \quad \dots(7)$$

$$Y \geq 10.2606 - 60.3765X + 118.5901X^2 - 75.9408X^3 \quad \dots(8)$$

$$Y \leq -6.8296 + 29.9281X - 38.6228X^2 + 14.0747X^3 \quad \dots(9).$$

4. The master disc for the preparation of an optical recording medium according to claim 1 wherein, if a phase depth of said first and second groove patterns represented by  $x \times n_x / \lambda$ ,  $x$  being said first depth and  $n_x$  being a refractive index of a medium from the light incident surface to said first and second grooves, is  $X$ , and if a phase depth of said third groove pattern represented by  $y \times n_y / \lambda$ ,  $y$  being said second depth and  $n_y$  being a refractive index of a medium from the light incident surface to said third groove, is  $Y$ , said first, second and third groove patterns are set for satisfying the equations (10), (11) and (12):

$$Y \geq 0.8680 - 7.3968X + 21.856X^2 - 17.5125X^3 \quad \dots(10)$$

$$Y \geq 36.9189 - 208.0190X + 294.3845X^2 \quad \dots(11)$$

$$Y \leq -214.05681 + 2423.29342X - 10933.24673X^2 + 24597.79851X^3 - 27576.99399X^4 + 12319.79865X^5 \quad \dots(12).$$

5. The master disc for the preparation of an optical recording medium according to claim 1 wherein at least one of said first and second groove patterns is a crest-and-groove pattern corresponding to a wobbling groove formed so that at least a portion thereof is meandered.

6. An optical recording and/or reproducing apparatus for recording and/or reproducing the information by illuminating the light with a wavelength  $\lambda$  on an optical recording medium having a groove formed along a recording track, comprising:

a light source configured to produce said light with a wavelength  $\lambda$ ;

an optical system configured to orient said light on said optical recording medium;

and

a rotational driving unit configured to hold said optical recording medium, wherein said optical recording medium is such a one in which, as said groove, a first groove and a second groove are formed to a first depth to describe a double helix and wherein a third groove having a second depth shallower than said first depth is formed between said first and second grooves describing double helices, wherein at least one of said first and second grooves is a wobbling groove formed so that at least a portion thereof is meandered.

7. The optical recording and/or reproducing apparatus according to claim 6 wherein, if a phase depth of said first and second grooves represented by  $x \times n_x / \lambda$ ,  $x$  being said first depth and  $n_x$  being a refractive index of a medium from the light incident surface to said first and second grooves, is  $X$ , and if a phase depth of said third groove represented by  $y \times n_y / \lambda$ ,  $y$  being said second depth and  $n_y$  being a refractive index of a medium from the light incident surface to said third groove, is  $Y$ , said first, second and third grooves are set for satisfying the equations (1) to (3) or the equations (4) and (5):

$$Y \geq 36.9189 - 208.0190X + 294.3845X^2 \quad \cdots(1)$$

$$Y \geq -1.2977 + 8.2017X - 15.8226X^2 + 12.3273X^3 \quad \cdots(2)$$

$$Y \leq -214.05681 + 2423.29342X - 10933.24673X^2 + 24597.79851X^3 - 27576.99399X^4 + 12319.79865X^5$$

...(3)

$$Y \geq -4.6463 + 30.2156X - 64.3100X^2 + 47.1308X^3$$

...(4)

$$Y \leq 2.7669 - 20.0529X + 48.0353X^2 - 35.4870X^3$$

...(5).

8. The optical recording and/or reproducing apparatus according to claim 6 wherein, if a phase depth of said first and second grooves represented by  $x \times n_x / \lambda$ ,  $x$  being said first depth and  $n_x$  being a refractive index of a medium from the light incident surface to said first and second grooves, is  $X$ , and if a phase depth of said third groove represented by  $y \times n_y / \lambda$ ,  $y$  being said second depth and  $n_y$  being a refractive index of a medium from the light incident surface to said third groove, is  $Y$ , said first, second and third grooves are set for satisfying the equations (6) and (7) or the equations (8) and (9):

$$Y \geq 0.8680 - 7.3968X + 21.8561X^2 - 17.5125X^3$$

...(6).

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$$Y \geq 10.2606 - 60.3765X + 118.5901X^2 - 75.9408X^3$$

...(8)

$$Y \leq -6.8296 + 29.9281X - 38.6228X^2 + 14.0747X^3$$

...(9).

9. The optical recording and/or reproducing apparatus according to claim 6 wherein, if a phase depth of said first and second grooves represented by  $x \times n_x / \lambda$ ,  $x$  being said first depth and  $n_x$  being a refractive index of a medium from the light incident surface to said first and second grooves, is  $X$ , and if a phase depth of said third groove represented by  $y \times n_y / \lambda$ ,  $y$  being said second depth and  $n_y$  being a refractive index of a medium from the light incident surface to said third groove, is  $Y$ , said first, second and third grooves are set for satisfying the equations (10), (11) and (12):

$$Y \geq 0.8680 - 7.3968X + 21.856X^2 - 17.5125X^3$$

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$$Y \geq 36.9189 - 208.0190X + 294.3845X^2 \quad \dots(11)$$

$$Y \leq -214.05681 + 2423.29342X - 10933.24673X^2 + 24597.79851X^3 - 27576.99399X^4 + 12319.79865X^5 \quad \dots(12).$$

10. The optical recording and/or reproducing apparatus according to claim 6 wherein at least one of said first and second grooves is a wobbling groove formed so that at least a portion thereof is meandered.

11. The optical recording and/or reproducing apparatus according to claim 6 wherein, if the numerical aperture of an optical lens used for recording and/or reproduction is NA, the spatial frequency of the track pitch is larger than the cut-off frequency represented by  $2 \times NA / \lambda$